XLIX.—*On a new Genus of Devonian Corals, with Descriptions of some Species of the same.* By H. Alleyne Nicholson, M.D., D.Sc., Regius Professor of Natural History in the University of Aberdeen; and Arthur H. Foord, F.G.S., late of the Geological Survey of Canada.

[Plate XVII.]

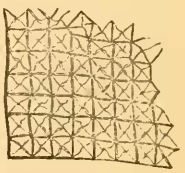
[Continued from p. 400.]

Rhaphidopora stromatoporoides (continued).

We are, however, entirely satisfied that the appearances just described, upon which Schlüter founded his *Pachytheca stellimicans*, are of purely inorganic origin, and are the result of mineralization. They are probably due to a finely fibrous crystallization of the calcite, which has caused the dark-coloured impurities in the matrix to arrange themselves in conformity with the crystalline fibres. The radiating fibres thus produced frequently extend from one tube to another, cutting through the walls of the corallites, and so producing the beautiful starry appearance which characterizes tangential sections, and upon which Prof. Schlüter based his name of "*stellimicans*"*. This process of mineralization was potent enough to effect the almost complete destruction of the tabulæ, and in large part that of the walls of the corallites as well, the latter remaining in parts only obscurely discernible. Here and there this process was not quite complete, and hence we sometimes find spots in most vertical sections (Pl. XVI. figs. 1 *c* and 7) in which the visceral chambers have not been wholly occupied by this infiltrated material, but have been partially filled with clear calcite, and have the tabulæ still left. Moreover, by the extension of the radiating crystalline fibres from each centre of crystallization through the walls of the corallites into contiguous tubes were produced those curious dark transverse bars seen in tangential sections intersecting the walls of the tubes, and regarded by Prof. Schlüter as of the nature of filled-up mural pores.

That the remarkable structure here in question is the result of some such process of infiltration and crystallization as above sketched out is rendered certain by the examination of a suffi-

* A somewhat similar appearance is presented in tangential sections of *Monotrypa quadrata*, Rominger, a Monticuliporoid from the Cincinnati group (Caradoc) of Cincinnati, Ohio. In this we find the visceral cavities of the corallites traversed by irregular lines, which radiate from each angle of the cell-wall and meet in the centre (see woodcut). The same phenomenon is met with also in some other palæozoic corals.



ciently large series of thin sections, since we then find all possible gradations to exist between the specimens of the first group ("*piliformis*" group) and those of the second ("*stellimicans*" group). Indeed, a single slide will sometimes exhibit almost all the transitional stages which conduct us from the one group to the other. Thus we find certain specimens in which the corallites, either throughout the entire corallum or merely here and there, have their visceral chambers quite free from the darker material. Even in such specimens (Pl. XV. figs. 5, 6, and also woodcut, fig. A) we find, however, that the walls are not uncommonly slightly thick-

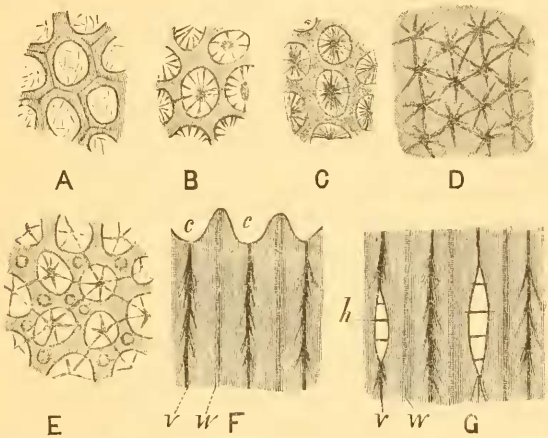


Fig. A. A few cells from a slide of *R. stromatoporoides*, Roem., taken from a part where the visceral chambers of the corallites are filled only with clear crystalline calcite, and the walls are only slightly altered. Fig. B. A few cells from another part of the same slide, in which the radiating crystalline structure is incompletely developed, the walls of the corallites being still discernible and the visceral chambers partly unaffected (filled with matrix). Fig. C. A few cells from another part of the same slide, in which the walls are still to be seen, but the crystallization has assumed its characteristic stellate form. Fig. D. Another part of the same slide, in which the walls of the tubes have become completely obliterated, and we see only the dark stars, the centres of these corresponding with the centres of the visceral chambers. Fig. E. A few cells from a slide of another specimen, in which the walls are left, and the rays of the crystalline stars are seen cutting through the walls, and thus uniting with contiguous stars. Fig. F. Part of a vertical section of the same, completely crystallized: and fig. G. Another vertical section incompletely infiltrated: *v*, dark lines representing the axes of the visceral chambers: *w*, faint vertical lines, representing the walls of the corallites: *h*, portions of the visceral chambers infiltrated only with clear calcite, and still showing tabulæ; *c*, calices. All the figures are enlarged twenty-four times.

ened, while a more or less conspicuous crystalline structure of the wall is almost always developed. This crystalline structure is shown in two ways. In the first place, the walls of the corallites, as seen in either horizontal or vertical sections, exhibit dark and light patches, often angular, and sometimes very regularly disposed (Pl. XV. fig. 7 *a*, and Pl. XVII. fig. 3), the cause of this being clearly the different orientation of the calcite crystals traversed by the plane of the section. In the second place, contiguous visceral cavities are seen in transverse sections to be united by dark lines or bars which run transversely across the walls and are sometimes very regular in their arrangement (Pl. XVII. fig. 3). These bars are the beginning of the radiate crystallization which ultimately gives rise to the "*stellimicans*" structure.

In other specimens, again, or in particular parts of a specimen, we find the radiating crystalline structure further developed, a zone of radiating crystalline fibres now lining each corallite, but the walls of the corallites still remaining visible (woodcut, fig. B). This lining may be so thick as to leave open only a small central space in each corallite (Pl. XVI. fig. 5), or it may extend quite to the centre of the corallites, in which case each tube is filled with a more or less marked crystalline stellate mass (Pl. XVI. fig. 3, and woodcut, fig. E).

The next stage is the more or less complete obliteration of the walls of the corallites. This sometimes takes place while the central portion of the visceral chamber is yet uninfiltrated (Pl. XVI. fig. 2 *a*). More commonly the obliteration of the walls is accompanied by the complete infiltration of the corallites, in which case there is developed the typical "*stellimicans*" structure previously described (Pl. XVI. fig. 2, and woodcut, fig. D).

Vertical sections show much the same differences in the extent of the infiltration and subsequent crystallization by which they have been affected; but the walls are usually less easily recognizable in these than in transverse sections (Pl. XVI. fig. 1 *c*, and part of figs. 4 and 6; Pl. XVII. fig. 4). It is usually the case also that the tabulæ have been completely obliterated; but in most sections we may find here and there smaller or larger portions of the visceral cavity—always occupying the centre of the cavity—to which the infiltrating material, owing to some local cause, has not penetrated, and in which we meet with transparent calcite intersected by the remnants of the tabulæ (Pl. XVI. figs. 1 *c* and 7, Pl. XVII. fig. 4, and woodcut, fig. G). This fact, among others, would show that the stellate crystallization has struck inwards from the walls towards the centre of the tubes, and not *vice versâ*.

The only other point in connexion with this singular crystalline structure with regard to which a few words may be said is as to whether or not a similar structure is ever developed in *R. crinalis* as well as in *R. stromatoporoides*. Considering that these two species are very closely allied and that they commonly occur in association, we should expect that such a purely inorganic change as that which induces the "*stellimicans*" condition would equally affect both these forms. As a matter of fact we think it probable that of the many specimens in the "*stellimicans*" state which we have examined some are really referable to *R. crinalis*, Schlüt., and not to *R. stromatoporoides*, Roem. As, however, the induction of this condition more or less extensively obliterates the normal structures of the coral, we are not prepared to assert this positively. We do meet, however, with "*stellimicans*" specimens in which the tubes are decidedly larger than they are in the majority of examples (see Pl. XVII. fig. 1), and it is not improbable that these represent examples of *R. crinalis* which have undergone this peculiar process of mineralization. We have, moreover, a specimen from the Devonian rocks of Devonshire consisting of two superposed colonies which presumably belong to a single species, and of which one colony is in its normal state, while the other is in the extreme form of the "*stellimicans*" condition. The unaltered colony (Pl. XVII. fig. 6) is undoubtedly *R. crinalis*, and the "*stellimicans*" colony (Pl. XVII. fig. 5) is *probably* the same, though its tubes are certainly not so large as those of its fellow.

Finally, we cannot pass over without remark the singular tubercles which are commonly developed in *R. stromatoporoides* at the angles of junction of the corallites (Pl. XVI. figs. 1 *a*, 3, and 5). These structures are something like the "acanthopores" of the Monticuliporoids, but are undoubtedly of a different nature. They are best seen in specimens in the "*stellimicans*" condition, when the walls are not completely destroyed; but there are indications of their presence in even normal examples of the species. We are inclined to think, however, that they are merely the result of mineralization affecting in some peculiar way the thickened angles of junction of the tubes.

Formation and Locality. Abundant in the Middle Devonian of Gerolstein, in the Eifel, where it occurs in all its forms. Rare in the Middle Devonian of Teignmouth, Devonshire.

Rhaphidopora ? sp. (Pl. XVII. figs. 7-10.)

We have seen that both *R. crinalis*, Schlüt., and *R. stromatoporoides*, Roem., occur in the Devonian rocks of Devonshire. We have here figured slides of two other examples of *Rhaphidopora* which we have from the same formation and which we are unable to identify with certainty. One of these (Pl. XVII. figs. 7 and 8) exhibits rounded thick-walled tubes, intersected by complete horizontal tabulæ, but apparently without septal spines. The diameter of the tubes is on an average about a third of a millimetre. The specimen from which these slides were taken was collected by Mr. Champernowne in the Middle Devonian Limestone of Dartington, and forms a mass of considerable size. The specimen is highly mineralized, and the absence of the septal spines may be due to this. It is not improbable, therefore, that this is only an altered example of *R. crinalis*, Schlüt.

The other specimen to which we refer (Pl. XVII. figs. 9 and 10) is from Teignmouth, and agrees with the preceding in the general dimensions of its tubes and the apparent absence of septal spines. Its distinguishing feature is the angularity of the corallites and their comparatively irregular shape. This specimen also is much mineralized and does not admit of positive specific characterization; it cannot even be stated with certainty to belong to the genus *Rhaphidopora* at all.

EXPLANATION OF PLATE XVII.

Fig. 1. Part of the vertical section of a double colony of *R. crinalis*, Schlüt. (?), enlarged twelve times, in which one colony is normal and the other is in the "*stellimicans*" state. This may be only an example of *R. stromatoporoides*, Roem., with unusually large tubes. Middle Devonian, Gerolstein.

Fig. 2. Part of a tangential section of *R. stromatoporoides*, Roem., in the "*stellimicans*" state, enlarged twenty times. The tubes are below the average size. Middle Devonian, Gerolstein.

Fig. 3. Part of a tangential section of *R. stromatoporoides*, Roem., enlarged twenty-four times. The walls of the corallites are highly crystallized, and are completely fused with their crystalline lining, no longer appearing as distinct structures in the portion of the section figured. The centres of the visceral cavities are still unobliterated, and they are joined by regular radiating lines, the result of stellate crystallization. Middle Devonian, Gerolstein.

Fig. 4. Vertical section of a specimen of *R. stromatoporoides*, Roem., which is wholly in the "*stellimicans*" state. It consists of several superposed colonies, of which the lowest has tubes of much larger size than the others, and *may* belong to *R. crinalis*, Schlüt. Enlarged twelve times. Middle Devonian, Gerolstein.

Fig. 5. Tangential section of a specimen of *R. crinalis*, Schlüt (?), enlarged twelve times, from the Middle Devonian of Teignmouth. The specimen consists of two superposed layers or colonies, of which one is in the "*stellimicans*" state, while the other is normal. The former is here figured.

Fig. 6. Vertical section of the normal layer of the specimen just referred to. The tubes in this layer are larger than those in the layer represented in fig. 5, and certainly belong to *R. crinalis*, Schlüt.

Fig. 7. Tangential section of *Rhaphidopora crinalis*, Schlüt. (?), from the Middle Devonian of Dartington (coll. A. Champernowne), enlarged twelve times.

Fig. 8. Vertical section of the same, similarly enlarged.

Fig. 9. Tangential section of *Rhaphidopora* (?) sp., from the Middle Devonian of Teignmouth, enlarged twelve times.

Fig. 10. Vertical section of the same, similarly enlarged.

L.—*Additional Remarks on the External Aspect of the Tunny.*

By Prof. W. C. M'Intosh, M.D., LL.D., F.R.S., &c.

The head and some other parts of the specimen of *Orcynus thynnus* mentioned in the 'Annals' for April were reserved for a subsequent communication, and hence no special allusion was made to the teeth. These of course occur on the vomer, in which respect, as my friend Mr. Day (whose valuable and long-continued labours amongst the fishes of our own and foreign countries would alone command respect) says, it differs from such as the bonito (*Thynnus pelamys*), a very good example of which was caught near St. Andrews, and is now, thanks to Dr. J. Moir, in the University Museum. Mr. Day's drawing of the teeth was not specially alluded to otherwise than by the general statement that "the teeth are somewhat fancifully represented in all the figures." The facts are that in his plate about eighteen or twenty teeth occur in a lateral view along the premaxillæ and maxillæ, and about fourteen or fifteen in the mandible. In the adult male about fifty occur in each of the series above mentioned. A similar criticism applies to his illustration of the dentition of the bonito. I know it is very difficult to give an adequate representation of such a range of small teeth in a figure of the size of Mr. Day's, and only allude to this to indicate that accuracy was the sole aim of my remarks.

In regard to the dorsal spines * there is a decided divergence between the figure in Day's 'British and Irish Fishes' and the example at St. Andrews, since the first spine is much

* These are thirteen in number.